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EDITORIAL

IN the introductory article to the first issue of *Symons's Monthly Meteorological Magazine*, for February, 1866, Symons wrote: "I hope to give in future numbers . . . above, all, the latest rainfall intelligence. . . ." A short note in the same number explained the arrangement of the rainfall table for January, 1866, which included records for 50 stations in all parts of the country, giving the total fall, the difference from the average, the maximum daily fall and date, and the number of days with rain. On the opposite page were printed selections from the observer's notes on the weather during the month. In January, 1867, there were added to the table the maximum and minimum shade temperature, with dates and the number of days of frost.

The publication of tables and notes on these lines, as a matter of fact, preceded the magazine, for since 1863 Symons had printed *Rainfall Circulars* on similar lines, as supplements to *British Rainfall*, giving records and "remarks" for 20 stations. It is interesting that throughout the sixty years which have elapsed since its inception, this rainfall table has appeared each month in substantially the same form. It was commonly referred to by the Editor as the "regular" table.

In July, 1874, at the request of several readers, a short supplementary table, giving the total rainfall only, at 15 additional stations, was added. This was subsequently increased in size till it comprised about 100 records.

In 1907 the columns of temperature were dropped, it being

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felt that the publication of more comprehensive and more closely scrutinized records in the *Monthly Weather Report* of the Meteorological Office rendered their retention unnecessary.

The observers' notes on the weather remained a feature of the magazine until July, 1914, when they were incorporated in a single article on the weather of the month, compiled with the assistance of the *Daily Weather Report* of the Meteorological Office. This section has since January, 1920, been considerably enlarged and has been supplemented by notes on the weather in other parts of the world, more particularly in western Europe.

In February, 1908, appeared for the first time a map showing the distribution of rainfall in the previous month in the Thames Valley and surrounding districts. This map was printed in colour and showed the configuration of the land by means of tints, thus enabling the correlation between the rainfall and the land contour to be studied conveniently.

Since 1919, the amount of information as to the rainfall of the British Isles which has been published at the end of each month has been increased by the inclusion of a supplementary rainfall table in the *Monthly Weather Report* of the Meteorological Office. This table, compiled from the records sent to the British Rainfall Organization, contains about 200 records, the data being confined to the monthly totals. Most of the records in the table in question appear in this magazine also. The publication of the table is discontinued after December, 1922.

With the present issue the two rainfall tables are being incorporated, the number of records being increased to 228. Practically all the stations formerly in the supplementary table of the *Monthly Weather Report* are included. The number of stations for which average values are available is now much larger than formerly and the percentage of the average can be added in 170 cases. In order to make space for the new records the maximum daily fall and number of rain-days are omitted.

The article on the weather of the month has been reduced in length. For fuller detail, readers will be able to refer, however, to the *Monthly Weather Report*. The notes on the distribution of rainfall during the month no longer appear to be necessary, the extended table giving much fuller information. It is proposed, however, to publish notes on exceptional phenomena.

Lastly, the map showing the distribution of rainfall over the Thames Valley is dropped. The preparation of this map in time for publication has always presented considerable difficulty and in many cases records received too late for incorporation have shown it to have been in error. The publication of a rainfall map of the whole country in the *Monthly Weather Report* will, however, be continued.

Anti-Solar Rays

THE sketch reproduced as the frontispiece to this volume was made some years ago by Mr. G. A. Clarke. Enquiries concerning anti-solar rays and allied phenomena have lately been received at the Meteorological Office, and the publication of this sketch is therefore appropriate. Mr. Clarke has kindly contributed a note to accompany it.

Anti-Solar Rays and Cloud Shadows.

By G. A. CLARKE.

ON certain occasions, just about the time of sunset, a rather curious phenomenon may be observed in the eastern sky. If the observer looks toward the point on the eastern horizon diametrically opposite to that where the sun is setting, he may see a series of converging rays of light which convey the impression that a source of light is about to rise in the east. An example of such an observation is shown in the frontispiece, and is from a drawing made at Aberdeen on July 5th, 1911. The note made at the time of the observation was as follows :—

> " At about 20h. 55m. the sun was setting behind a very low belt of cumulus cloud along the north-west horizon ; and no optical effect was to be seen in the neighbourhood of the sun, except a bright silvery sheen. No rays whatever were visible where the sun had just disappeared behind the cloud, but on looking towards the south-east horizon, diametrically opposite the sun's position, several very distinct rays of light were quite plainly seen, all converging towards one point on the south-east horizon. They gave the impression that the sun was either setting or rising in the south-east. They were not visible for more than about 20° (estimated) above the horizon, and were brighter at the horizon, fading gradually upwards. There was no cloud whatever in the sky save the cumulus bank above referred to."

It is rather curious that during the course of the same day a very unusual green sky-colouring was seen and noted as follows :—

> " On Wednesday, July 5th, from 10h. to 16h., the sky along the whole western horizon appeared to be of a very light emerald green colour, from the horizon to an altitude of about 10 or 12 degrees (measured with theodolite). The green tint was most distinctly noticeable and was much lighter in tone than the tint of blue usually to be seen in that region. In fact there seemed almost to be a luminosity inherent in the colour. The green tint faded rather sharply into the blue of the sky, which otherwise was of the blue ordinarily seen there."

This phenomenon of the convergent rays of the sun has been seen on several occasions at Aberdeen, but is nevertheless very uncommon. On another occasion, March 3rd, 1912, there were seen at 18h. three of these rays stretching from a little to the west of the zenith down towards the eastern horizon (which was not reached by the rays); the vanishing point of the rays would have been about east-by-north. On this occasion the rays were pure rose pink in colour. In the first mentioned case their colour was white.

If we take into consideration the colours of the rays in both cases, and also the region of green sky-colouring in the first case, it appears likely that the phenomenon is produced by dust in the higher regions of the atmosphere. If the western horizon were perfectly level, and if there were no clouds present, this dust at very great altitudes would simply be the cause of a general brightening or tinting of the sky; but, if the passage of the sun's last rays is interrupted by cloud or by irregularities on the western horizon, the effect produced will then be a series of bands as shown in the picture. The bands are of course parallel, the appearance of convergence is only the effect of perspective. A confirmation of the hypothesis that dust in the higher regions of the atmosphere is a favourable condition for the observation of converging rays is, perhaps, to be found in the fact that, in the case of the rays seen in March, 1912, the rose colour was identical with that of the "purple light" when the latter is best displayed.

One rather curious variation of this phenomenon was once seen at Aberdeen, but the actual date of its occurrence is uncertain. The sun was just setting, and had just appeared below the western edge of a widespread sheet of high alto-stratus. The whole atmosphere below the cloud sheet was suffused with pale orange light, and overhead, near the zenith, a long line of small detached cumulus clouds stretched from south to north. Each of these clouds cast a long dark band of shadow towards the eastern horizon, so that there appeared to be a series of converging dark bands across the eastern part of the sky, each band proceeding from a small cumulus cloud.

A letter from Mr. Karl Durston, of Bude, Cornwall, records the observation of a single broad anti-solar beam.

Mr. Durston writes:—

> "At 18h. 25m. G.M.T. to-day (August 31st, 1922), the sky was about three-quarters covered with ragged cumulo-nimbus clouds but was fairly clear in the zenith. The sun was hidden behind some clouds but was throwing out five beams on the water. Exactly opposite the sun were

similar ragged cumulo-nimbus clouds through which showed a dark, almost black, purple sky, and from the horizon a beam of light, the width of any two of the beams from the sun shot up to the same level as the sun on the other side. It remained for about ten minutes."

An example of the shadow of a cirrus plume, observed by Mr. Frank Edwards, of Manchester, is described as follows :—

"At 18h. 45m. G.M.T. on August 20th, 1922, the greater part of the sky was covered with cirrus or cirro-stratus. In the west was a long streak of cirrus-uncinus rising out of a complex of interlaced cirrus to about 60° above the horizon. The sun was behind this complex and from the plume end of the streak a dark shadow bar extended to the east-south-east. It was noticeable down to the horizon and persisted for about 10 minutes, when it faded out. The sky in which the shadow was projected was cloud free. In appearance it much resembled the shadow occasionally seen above a large cumulus crossing the sun when the luminary is low in the sky."

OFFICIAL NOTICES

A Course of Training for Observers

It is proposed to inaugurate a course of training for meteorological observers and deputy-observers, more especially for those at Health Resorts. The course will be held at Kew Observatory in April, 1923, beginning on a Monday afternoon and finishing on the following Saturday morning. Particulars may be had on application to *The Director, Meteorological Office, Air Ministry, Kingsway, W.C. 2.*

Staff News

The degree of D.Sc. has been conferred on W. A. Harwood by the University of Manchester for a thesis on *Upper Air Work in India* which will shortly be published by the Indian Meteorological Department.

The University of London has conferred the degree of M.Sc. on Messrs. S. N. Sen and J. Glasspoole, the former for a thesis entitled *On the Distribution of Air Density over the Globe* and the latter for work on the rainfall of the British Isles, including two papers, namely, *The Drought of 1921, Section A* (Q.J.R.Met. Soc. Vol. XLVIII., pp. 139-157), and *The Fluctuations of Annual Rainfall* (since published in British Rainfall, 1921).

Messrs. R. G. Veryard and B. A. Copping have graduated as B.Sc. of the University of London.

G. ff. H. Lloyd, R.D., in charge of the Port Meteorological Office, Liverpool, is promoted from Lieutenant-Commander to Commander of the Royal Naval Reserve.

Shoeburyness. On Thursday evening, January 25th, a Meteorological Office Staff Dinner was held at the Queen's Hotel, Westcliff. The chair was occupied by Mr. C. E. Britton and there were 11 present, the guest of the evening being Captain D. Brunt, the Superintendent of Army Services.

Meteorological Office Soirée. The staff of the Meteorological Office held their Fourth Annual Soirée on February 9th, 1923, at the Holborn Hall, W.C. The soirée took the form of a dance, with musical items interspersed. About 250, members of the staff and their friends, were present, Dr. G. C. Simpson and Mrs. Simpson being among the number.

Official Publications

The Fernley Observatory, Southport. Report and Results of Observations for the year 1921. By Joseph Baxendell.

The year 1921 marks the jubilee of the Fernley Observatory so that this volume of the report appropriately contains a brief history of the Observatory and its founders.

The usual detailed account of the year's weather is supplemented by an appendix and by further details of the investigation of meteorological periodicities, carried out in this year by Mr. Charles Baxendell. Among other periodicities discussed may be mentioned that of 2·2 years. Strong evidence for this period, first discussed by Mr. C. E. P. Brooks, has been found by examination of the Southport records of rainfall and barometric pressure. There is a suggestion that this period coincides with an infantile mortality period, caused largely by measles.

The appendix consists of an analysis of the amount and duration of rainfall at Southport under different wind directions for the 10 years 1912-1921 and a comparison of the wind and rainfall of the west and east coasts of northern England, as exemplified by Southport and Sunderland.

The differences between the two stations are striking. At Southport, the wettest winds are south, south-west and then south-east, the driest being north-west and north, while at Sunderland north, east and north-east are the wet winds and west and south-west the dry.

Discussions at the Meteorological Office

January 22nd, 1923. *Meteorological Conditions for the Formation of Rain* and *Life Cycle of Cyclones and the Polar Front Theory of Atmospheric Circulation.* By J. Bjerknes and H. Solberg (Geofysiske Publikationer, Vol. II., 1922, No. 3 and Vol. III., 1922, No. 1).

Opener—Lieutenant-Colonel E. Gold, D.S.O., F.R.S.

In summing up his account of these two papers Colonel Gold declared that they were remarkable not only for the youth of their authors and for the freshness of the ideas which were set out but for the clearness with which the ideas were expressed, a triumph for men writing in a foreign language.

The first paper, which has been summarized already in *The Meteorological Magazine**, shows the progress that has been made in Norway in recognizing the different circumstances in which rainfall occurs. How far the generalizations are applicable to other parts of the globe and especially to our own section of the western seaboard of Europe is a question to which an answer cannot yet be given. The configuration of the land is of paramount importance in Norway. Even with the modest height of our own hill country the control of the weather by configuration is manifest.

In introducing the second paper Colonel Gold asked his audience to think of the air of the northern regions as contained in a great flat bag. The air inside the bag is cold, and warm air approaching it from the south rises over the bag without breaking it. Cyclones are represented by crinkles which develop in the sides of the bag. The special feature of the paper under review is the propounding of the rule that cyclones occur in families, the founder of the family passing through the stages of its life in high latitudes, the children of the first and following generations coming further south. After the passage of the last of the family the northerly air has a through channel to the trade wind zone or, to revert to Colonel Gold's analogy, the bag bursts and cold air escapes. Colonel Gold suggested that the "bag" would have to be replenished by the warm air on top of it cooling and finding its way in. The authors picture the northern hemisphere with four or five families of cyclones and the intervening anti-cyclones all circulating round the pole. This picture does not seem consistent with the idea that the families are continually dying out, in any case it does not make sufficient allowance for the circumstances of a hemisphere with large land masses. As Sir Napier Shaw remarked in the discussion, it recalls Lockyer's theory of the circulation in the

* August, 1922, p. 192.

southern hemisphere where there is a closer approach to uniformity. Whatever view may be taken of this outgrowth of the theory, there can be no doubt but that the " polar front " is proving a great stimulus to research in meteorology. Of that the vigorous debate on this occasion was sufficient evidence.

February 5th, 1923. *On Cloud Formation.* (*Nuclei of condensation, haziness, dimensions of cloud-particles*). By Dr. C. Braak. (K.Magn. en Met. Obs. Verh., No. 10, Batavia, 1922).

Opener—Dr. J. S. Owens.

The Aitken " dust-counter " serves, it will be remembered, for counting the number of nuclei of condensation in the atmosphere. The apparatus was invented some thirty years ago, but there are few accounts of systematic observations made with it. In Dr. Braak's tables are found details of observations on the East Indian Seas and at various stations on land, mostly in Java. As the author points out, the large number of condensation-nuclei found at most of the land stations is to be attributed to pollution of the air by smoke. The lowest readings were found for the open sea and for the mountain stations. In the open sea under humid conditions the number of nuclei was found to be as low as 120 per cubic centimetre.

In another series of observations the diameters of the drops of mountain clouds are placed on record ; the determinations were made, some directly by the microscope, others by the measurement of the diameters of " glories," etc. The remarkable generalization is reached that the predominating size of droplets has a tendency to retain its value for 24 hours or more.

On the more theoretical side there is discussion of the part played by hygroscopic nuclei in producing atmospheric obscurity on the one hand and cloud and rain on the other. A brief summary is not practicable. Dr. Owens took the opportunity to exhibit lantern slides shewing the various forms of matter collected from the air ; crystals of common salt predominate on many of the slides. The relation between the crystals and the Aitken nuclei remains to be worked out.

The subject for discussion on Monday, February 19th, 1923, will be a paper by F. A. Lindemann and G. M. B. Dobson on *A theory of meteors and the density and temperature of the outer air to which it leads.* (Proc. Roy. Soc. A. Vol. 102, 1922, pp. 411-437). *Opener*—Captain N. K. Johnson.

On March 5th, Sir David Wilson Barker will open a discussion on *The pilot charts of the South Atlantic and South Pacific* (U.S. Hydrographic Office).

Royal Meteorological Society

THE Annual General Meeting of this Society was held on Wednesday, the 17th ult., at 49, Cromwell Road, S. Kensington, Dr. C. Chree, F.R.S., President, in the Chair. The Report of the Council for 1922 was read and adopted, and the Council for 1923 was duly elected.

The Presidential Address. Aurora and Allied Phenomena.

Dr. Chree's presidential address was characteristic. His audience enjoyed his dry humour and admired his grasp of the complicated phenomena with which he had to deal. In his opening remarks Dr. Chree spoke with toleration of those scientists who could not carry out researches vigorously without the stimulus of a theory, but he warned them against the temptation to over-emphasize the facts that suited their theories and to suppress others. In particular the need for caution in the advocacy of the rival theories that aurora is the product of the bombardment of the atmosphere by Alpha rays (helium atoms carrying positive charges of electricity) or Beta rays (electrons carrying negative electricity) was emphasized.

Amongst the minor questions which were raised was that of the audibility of aurora. Dr. Chree referred to Mr. Delday's comparison* of the sound sometimes heard on the nights when aurora is present to " the sound made when sifting meal in skin sieves " and quoted Sir Edgeworth David's account† of Amundsen's experience at Framheim : " Amundsen distinctly heard a very faint rhythmically repeated rustling noise in the air. After a time he discovered that this was due to the rapid freezing of the moisture from his breath, and the tiny tinkle made by the minute crystals as they slowly descended under gravity close to his face, sufficiently close for the ear just to catch the faint sound. He said there was no doubt about it that the rustling noises exactly coincided with the periods when he exhaled air from his lungs. He said that he was now confident that this was the true explanation of what the poets call the ' Crackling of the Northern Lights.' "

That Amundsen's explanation will not account for all the reports of audible aurora is evident since many refer to occasions when the breath could not possibly freeze. In fact, in our present state of ignorance, each individual record of sounds accompanying aurora should be discussed on its merits.

The publication of Dr. Chree's address will be awaited with interest.

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* *The Met. Mag.* Oct. 1922, p. 255.

† See *Audibility of the Aurora.* By J. G. Griffin. *J. R. Astro. Soc. Canada.* Vol. XVI. No. 7, 1922, p. 255.

Correspondence

To the Editors, *The Meteorological Magazine*

Simple Weather Forecasting

As I have been held up to ridicule by your correspondent "H." the following forecast, sent away on December 12th last and published in several papers, may not only interest your readers, but prove that what was dubbed mere "guess-work" is based on some sound principles:—

> "December 12th, 1922. For the next 7 to 8 days mainly very unsettled weather, with strong winds and gales, rain or snow in north being general. Then about 24th to 28th, a spell of finer, brighter, and colder weather is probable just previous to next change (December 28th to 30th). From 18th to 25th if wind works north when heavy winds are blowing, snow may be very much in evidence in the north of England.
>
> When earthquakes occur weather is always very uncertain, and sudden barometric and temperature changes, as recently, may be expected from time to time."

Over six weeks before this I stated in letters to correspondents that December 15th to 23rd would probably have very bad weather with heavy winds, and that gales would be remarkable for thunderstorm disturbances, and sudden changes of temperature.

A long forecast issued on August 31st gave the gales to start about October 18th to 21st, and easterly gales started in the English Channel on the evening of the 17th, reaching forces 7 to 8 between that date and the 20th. The same forecast gave the fogs which, starting on November 13th, prevailed as expected until the middle of December, and yet your correspondent called my system guess-work.

W. M. ROBERTSON.

15, *Edgar Road, Winchester, January*, 1923.

A Kaleidoscopic Sun

A VERY remarkable coronal (?) display was seen here on January the 9th, about 1.30 p.m. local mean time. During the entire forenoon an almost clear sky and sunshine prevailed and up to 1 p.m., when a slight snow-shower fell, clearing again a little later. A friend shouting to me to hurry out, I saw the sun behaving in a most unusual fashion; now surrounded by bright red, flashing rays in all directions, then changing to yellow in which the body of the sun, though more clearly visible, appeared to dance and shift about here and there in a radius of

about 5° ; again, changing to green, the rays flashing as in the red—all these changes taking place in less time that it takes to write.

Could this have been caused by a cloud of snow particles crossing the sun in otherwise clear air ?

Of all the beauties seen I should think the quickly changing mock suns the most beautiful as they flashed here and there faster than it was possible to count them. The colours were so brilliant and dazzling, that even after I had come indoors anything I looked at appeared a mixture of all the colours seen.

The only thing which I can compare it is Venus " boiling " in the telescope on a hazy windy evening, on a very large scale ; but no description is able to convey what was seen in these ten or twelve minutes.

JOSEPH MINTERN.

Kilmurry, Passage West, Co. Cork, January 13th, 1923.

Meteorology and Folklore : Thunder and Lightning

THE manifestations of electrical energy, commonly described as thunder and lightning are so awe-inspiring and frequent that it is no wonder that they should have given rise to an abundant crop of fancies, both sublime and grotesque.

Primitive man, watching the on-coming storm, compared the masses of black menacing clouds to a mighty bird, and in the thunder heard the beating of its pinions. Indeed Lewis Spence suggests that all thunder deities were originally bird-like in form ; *e.g.*, the great Aztec lightning and war god Uitzilopochtli bears a name which shows he was once a " humming-bird " pure and simple. The tribes of the Andes place the abode of the thunder on the cloud-enshrouded mountains, and say that through the rifts in the cloud-veil may be seen the red limbs of the storm-spirits.

Carlyle in the *Hero as Divinity* has summarized for us the thunder myth of Norse folklore

> " Thunder was not then mere Electricity, vitreous or resinous ; it was the God Donner (Thunder) or Thor,—God also of beneficent Summer heat. The thunder was his wrath, the gathering of the black clouds is the drawing down of Thor's angry brows ; the fire-bolt bursting out of Heaven is the all-rending Hammer flung from the hand of Thor ; he urges his loud chariot over the mountain-tops ;—that is the peal ; wrathful he ' blows in his red beard,'—that is the rustling storm-blast before the thunder begins."

Thor was also the patron of agriculture. Thunder gods seem to preside over both war and husbandry, probably the first

function is suggested by the clamour of the storm, and the second by the rains which accompany thunder.

It is rather curious to find an American thunder god who causes the noise by beating a sheet of metal in a manner reminiscent of civilised "stage-thunder." Thunder gods frequently have a spear or an arrow, the connection of which with the lightning is very obvious. The bolts of Zeus, forged by the Cyclops beneath Mount Etna, are the type, but there are as well the Mexican deity Mixcoatl, the Egyptian Neith, and half a dozen other American gods who have the same attributes. Often the lightning flash is symbolised by the serpent as in the case of "Mixcoatl" which means "Cloudserpent."

The Romans walled round and kept sacred all spots struck by lightning. The augurs, too, paid great attention to lightning, and often when it was considered desirable to postpone any awkward political assembly all the augurs had to do was to announce that lightning had been seen on that day.

CICELY M. BOTLEY.

16, *Wellington Road, Hastings, January 3rd*, 1923.

NOTES AND QUERIES

Surging Mirage

The *John O'Groat Journal*, January 26th, 1923, contains an interesting article by a lighthouseman, Mr. Kenneth Sinclair, dealing with his experience of mirage and abnormal refraction. We learn that in the Pentland Firth the superior mirage is sometimes referred to by the name of "Margaret, the Orkney Witch," a name which is faintly reminiscent of the Fata Morgana. (Is there good authority for the statement of the text-books that the Fata Morgana refers to Morgan, sister of King Arthur ?).

The most striking mirage in Mr. Sinclair's experience was observed from Fair Isle during April, 1919. He writes :—

> "Coming from the east toward the station about 8 a.m. I observed peculiar shades flittering at about an altitude of 22 to 30 degrees in the western sky. The sun was very bright and the sea carried a deep roll, so to speak, with a glassy surface, both of which, I consider, played an important part in this phenomenon. By the eye alone I could form no conception, so resorted to the telescope. By its aid, to my great surprise, I could see spread out a panorama wonderful to behold. The islands of North Ronaldshay, Sanday and Westray were stretched out, mapped and clothed in their natural beauty, against the curve of the western sky. But this most astonishing phenomenon increased in interest when I observed a reversed view, equally as clear, of North Ronaldshay and part of Sanday only, immediately under, as if growing from one base ; and, as sure as the timely rise and fall of the fountain ball, so did this strange sight rise

and fall as if governed by the movement of some sighing bosom. Each movement downwards seemed to separate each object at its base, and growing more distorted on the upward movement things gradually assumed their natural aspect, when I could make out many of the houses on North Ronaldshay, Star Point Lighthouse and farms on Sanday, also Noup Head, Westray. Noup Head Lighthouse is difficult to pick up with a good telescope in the clearest of weather from an altitude of 400 feet, but on this occasion it was clearly seen. This phenomenon kept clear for about an hour and, as it disappeared slowly, it seemed to sink down behind the horizon, leaving the high objects a little longer time to do their farewell bow.

"In September of the same year I saw a similar mirage, with the exception of no reverse view, and no part of Westray; and yet another difference—no rise and fall. On this occasion the sea was smooth, the sun bright and farther south, the hour being 9.30 a.m.

"One thing I noted about these phenomena struck me as strange. The April mirage could be seen from different parts near the station, and the one of September was limited to a few yards. . . . . .

"Mirages are rarely seen because their observation is limited from small areas."

According to theory a double superior mirage is occasioned by an inversion of temperature, the rise of temperature above the "deck" extending through a considerable height. The surging of the mirage implies that the "deck" was heaving. Such direct evidence for Helmholtz waves in the transition layer between a warm current and the cold air beneath it is valuable.

It is not obvious why the sight of a superior mirage should be confined to a small area; is the experience general?

An Unusual Sky Effect

On the evening of December 5th, 1922, Mr. T. H. Applegate observed a curious phenomenon from the meteorological station at Biggin Hill Aerodrome. At 20h. 30m. a squally west wind was blowing at a speed varying between 20 and 30 miles per hour. Light cloud of the strato-cumulus type, with frequent rifts, was moving from the west so that the sky was mainly covered with detached cloud but varied from clear to overcast. The cloud height was estimated to range from 2,500 ft. to 5,000 ft.

Near the west, at a point about 15° above the horizon, a white elliptical ring of light was clearly visible. The ring was complete except at its lowest extremity and appeared to move in the same direction as the cloud but with a somewhat less speed. The interior of the ring seemed to be clear in spite of the passage of clouds which were seen to enter and leave it. Only a few stars, however, were actually visible within the ring and these only at occasional intervals.

As the ring approached it increased in size and became a true circle with a diameter of about 60° just before it was

centered overhead. The lowest segment remained broken throughout. After passing the zenith the ring broke up and disappeared. For the whole period of its visibility the plane of the ring seemed to be inclined at an angle of 25° to the vertical, the upper segment being the nearer.

The moon was at an altitude of 27° and situated nearly due east. It was covered with thin cloud throughout the duration of the ring.

The phenomenon resembled a great smoke-ring. It has been suggested that it was the result of "sky-writing," but the time and other circumstances do not seem to render this probable. Information would be welcome from anyone who saw anything unusual on December 5th in the region of south-east England, or from those who have seen similar phenomena, unconnected with sky-writing, on previous occasions.

A Solitary Gust

A CHART from the anemograph maintained at Balmakewan, Kincardineshire, by Mr. W. Low is reproduced on page 15.

It shows a remarkable isolated gust of 60 miles per hour which occurred at 13h. 10m. on November 29th, 1922, the mean speed of the wind being under 20 miles per hour. The direction trace shows a veer from west to north at the time.

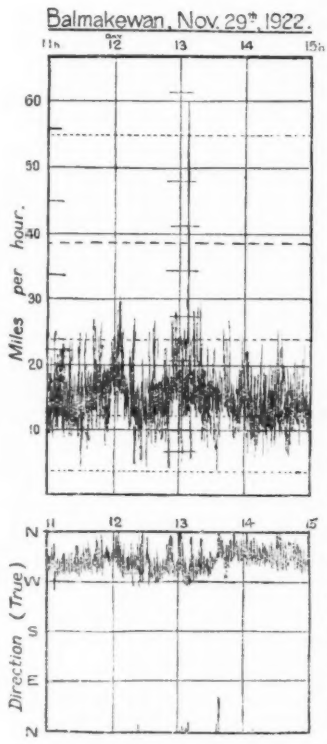
The gust seems to have been purely local, as no noteworthy gusts were reported from other stations.

Mr. Low writes :—

> ". . . the damage done here was not great, quite a number of suppressed and damaged branches from hard wood trees in the avenue were blown down and an isolated specimen Douglas fir lost a number of large lower branches. This tree often suffers as the branches are heavy and seem to be fairly brittle. It may be that the bad gale two years ago* [Dec. 3rd, 1920] carried away all the trees which are exposed to north. I find it is a prolonged gale that makes big gaps, as one tree falls on another and the wind is helped by the weight of the reclining tree ; then a gust brings it further down and the roots of the second tree thus begin to go. The damage grows on the compound interest principle."

The occurrence of an isolated gust with a wind-speed more than three times that of the general air-flow provides valuable confirmation for the highest gust on record in the British Isles. It will be remembered that this gust occurred at Quilty on the coast of Clare on January 27th, 1920. The pen passed beyond the edge of the chart of the Dines anemograph, so that the gust

* *See* this Magazine, Vol. 55, 1920, p. 286.



appears to have exceeded 108 miles per hour though the prevailing wind averaged only 50 miles per hour.

In a recent issue* of the *Meteorologische Zeitschrift* there is an article by Dr. H. Ficker on a remarkable barogram which illustrates the changes of pressure accompanying a hailstorm at Vienna on July 23rd, 1905, and shows an upward excursion of 4 millibars about the beginning of the storm ; the rise and fall of the trace are indistinguishable.

It is well known that irregularities of pressure are shown by a barogram in windy weather owing to the differences in pressure between the upwind and downwind sides of the building in which the instrument is placed. With a very sudden squall an isolated rise of pressure is to be expected. The static pressure due to a wind of 60 miles an hour would be nearly 4 millibars, so that the Balmakewan and Vienna records seem to imply gusts of about the same strength.

A New Observatory for the Canary Islands

THE establishment of a meteorological observatory at Santa Cruz de Tenerife was sanctioned by Royal Decree in July, 1921. It is now announced in the local press that the building has been started and will, it is hoped, be completed shortly. The Island of Teneriffe already has a first-class observatory at Izana, situated 2,307 metres above sea level, which was founded in 1916. Teneriffe is on the direct route from Lisbon to Rio de Janeiro, so that these two observatories will be of great service to Trans-Atlantic aerial navigation. A hydroplane station is also to be established on the island.

* November, 1922, p. 353.

Paradoxical Philosophy

A RECENT paper* by Professor V. Bjerknes, in which he gives the history of the developments in forecasting which have followed the recognition of the importance of surfaces of discontinuity in the atmosphere, demands attention by the way in which the author "grouses" at the inadequacy of the international telegrams. It appears that, in the absence of the details they require, the Norwegian meteorologists deduce from their own weather of to-day in Norway what weather must have prevailed in Scotland yesterday and use such deductions in constructing their own forecasts for to-morrow. In replying to the discussion on his paper, Bjerknes propounded the paradox that the forecaster should not aim to get 100 per cent. of his forecasts successful but rather 50 per cent. The interpretation of this dark saying is that much more detail should be attempted than has been customary in the past. 'Tis better to have plunged and lost than ever to have hedged at all!

The Key to Weather Forecasting

FROM the same paper we learn of the latest development in the Norwegian system of forecasting. The surfaces of discontinuity are discovered and from their rate of displacement the probable changes of position of the moving masses of air are estimated. Due allowance is made for the possibility that some of the masses will only progress by gliding over others. It is found that these estimates can be made with sufficient accuracy for the general course of the air currents to be predicted some days in advance.

The Supply of Forecasts to the Public

THE Meteorological Office has, since February 1st, 1923, issued three forecasts daily for London, that is, for the area within 10 miles of Charing Cross. Hitherto, London has been included in the forecast for southeast England, but the advances in forecasting have now made it possible to differentiate between the anticipated weather of London and that of the south-eastern coasts and counties. The forecasts are issued at 10h., 15h. 30m. and 20h. 30m. G.M.T., and are thus available for the early and late editions of evening papers and for morning papers respectively.

Another advance in the supply of information to the public was made by the introduction of radio-telephonic broadcasting of the official forecasts, which began in this country on November 14th, 1922. The provisional programme started then is now established, and two messages issued by the Meteorological Office are sent out by the British Broadcasting Company from London, Birmingham, Manchester and Newcastle, at about 6h. 30m. and 21h. 30m. each day.

* *Wettevorhersage.* A paper read at the Hundertjahrfeier Deutscher Naturforscher und Ärzte; see *Phys. Zs.* XXIII., 1922, p. 481.

The Study of Meteors

IT is announced that on March 21st, 1923, Major G. M. B. Dobson will deliver a lecture before the Royal Meteorological Society on meteors, with special reference to the investigation of the condition of the upper atmosphere.

Tickets for the lecture may be obtained on application to the Assistant Secretary of the Royal Meteorological Society.

According to recent work* of Professor Lindemann and Major Dobson the temperature of the atmosphere 50 miles up is about the same as that near the earth's surface. In a letter published in *Nature*, February 9th, 1923, Mr. F. J. W. Whipple points out that the hypothesis that the upper atmosphere has a comparatively high temperature provides a possible explanation of the occurrence of zones of audibility at considerable distances from explosions.

The Temperature of Meteors

THE temperature of a meteor before entry into the earth's atmosphere is the subject of a recent article† by Prof. Arthur Taber Jones, of Smith College, Northampton, Mass. Professor Jones finds that, on the assumption that the meteorite may be regarded as a black body absorbing all the heat it receives from the sun and then radiating this heat into space, its temperature will be 9° C. or 282 *a*. It is of interest to compare this result with Hann's value‡ for the mean temperature of the atmosphere near the ground, viz., 14.3° C. or 287.3 *a*. The circumstances of a meteorite for which temperature is kept more or less uniform by conduction are different from those of the earth's surface where the horizontal transfer of heat is mostly by air currents, but it would appear that the greenhouse or blanketing effect of the atmosphere only raises the average surface temperature of the earth by about 5.3° C., say 10° F.

The Study of "Atmospherics"

EXPERIMENTS which are in progress at the Radio Research Board Station at Aldershot are yielding definite information as to the character of the electric waves known as atmospherics. It has been found possible to determine the wave-form and the duration of the disturbance.

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* *A theory of meteors and the density and temperature of the outer atmosphere to which it leads.* By F. A. Lindemann, F.R.S., and G. M. B. Dobson, M.A. *Proc.Roy.Soc.* A. Vol. 102, 1922, pp. 411-437.

† *Science.* August, 1922.

‡ *Lehrbuch der Meteorologie.* 2nd Edition, 1913, p. 143.

A New "Weather and Wireless" Magazine

THE first number of *Quarterly Notes and General Forecasts of the British Weather Bureau Association* has been issued, bearing the date January, 1923. The primary object of this little paper, which is edited by Mr. D. W. Horner, appears to be the circulation of the forecasts made by Mr. W. M. Robertson, but it is intended to include general matter of interest to meteorologists. The annual subscription to the British Weather Bureau Association is 1s. 6d. Subscribers are entitled to the four quarterly issues of the Notes. The Association appears to have no officers at present beyond the editor of the Notes.

Upper Air Results in South Africa

The magazine of the *South African Irrigation Department* for January, 1923, contains an interesting article by Mr. G. W. Cox on upper air research.

The note, after giving a brief resumé of the history of the investigation of the upper air in other countries, continues with a description of the initiation of upper air research in South Africa. The first pilot balloon ascent in that country took place on June 18th, 1918, since when no less than 400 ascents have been made. The observations are taken with two "de Quervain" theodolites fitted with J. S. Dines's self-recording attachment.* The average results for ascents at Pretoria in December and January are given in diagrammatic form and show a rapid variation of wind-direction with height near the surface, a northerly wind at the surface backing to a southerly wind within 8,000 feet (2.4 km.). The average velocity at all heights up to 30,000 feet (9.1 km.) is less than 10 miles per hour but above that level the wind increases rapidly with height up to 40,000 feet, the greatest height shown.

Observations with sounding balloons have only recently been initiated and average values are not yet available. A graph of an ascent on May 18th, 1922, is, however, reproduced and shows that the stratosphere was reached on that occasion at 35,000 feet (10.7 km.) with a temperature of – 55° F. (225*a*). The latitude of Pretoria is 25° 45′ S. and the height of the tropopause is therefore considerably lower than observations in the Northern Hemisphere in similar latitudes would lead us to expect. It will be of interest to see if this result is borne out by subsequent observations. The values which, with the exception of some ascents by Dr. Griffith-Taylor in Australia, are the first for the middle latitudes of the Southern Hemisphere, form a valuable addition to our knowledge of the upper air.

* See *Technical Report of the Advisory Committee for Aeronautics for the Year 1910-11*, page 81.

Thomas Barker—The Diarist

THE latest number of *The Selborne Magazine* (Vol. XXIX., No. 350) contains a note to the effect that Thomas Barker, the author of the eighteenth century meteorological diary described by Mr. Britton in the November number of this Magazine, was the brother-in-law of Gilbert White, of Selborne. The note continues :—

> " It is interesting to recall the following quotation made by Mr. Rashleigh Holte White (*Life and Letters of Gilbert White*) from one of Barker's diaries :
>
> " ' 1736, March 31st—A flock of wild geese flew N.—G.W.'
>
> " ' 1736, April 6th—The Cuckoo heard.—G.W.'
>
> " There is little doubt but that the initials are those of Gilbert White, then fifteen years old, who was probably staying with his uncle and aunt at Whitwell Rectory, near Lyndon, where Mr. Barker lived."

The " Big Bang " of 1711.

THE same number of *The Selborne Magazine* gives an account of a note by Gilbert White which, as it is labelled page 285, was, no doubt, intended as an addendum to the *Natural History of Selborne*. The note is especially interesting just now as it deals with the audibility of the explosion of the gunboat *Edgar* at Spithead on October 15th, 1711. The crash was heard and the concussion felt more than thirty miles away, so that " a team at plow " ran away " with fury and amazement so as to tear the share out of the ground and drive it through the body of one of the horses."

Early Records of Notable Weather

MR. RICHARD COOKE, of Detling, near Maidstone, sends some weather notes which he has extracted from Parish Registers. The following are from *An Inventory of Parish Records and Registers of the Diocese of Canterbury*. By Rev. E. Eveleigh Woodruff (Canterbury : Gibbs and Co., 1922).

Ashford. (p. 6). Record of great rain in 1703 and later in the year a storm that raged by land and sea ; in consequence of the storm a fast was proclaimed by the Queen throughout the whole kingdom January 19th following.

Dymchurch. (p. 72). Memorandum that upon the 20th day of January, 1683, the sea at Dymchurch Wall was frozen about three miles from high water mark.—Basil Kenneth, Rector.

Goodnestone next Faversham. (p. 84). 1690, high tide with north west wind Oct. 12th, about 2 of the clock in the morning.

On Tuesday December 9th following, about 3 in the morning, a much more serious hightide doing worse and much more extended damage.

Seasalter. (p. 169). The summer of the year 1725 was the most dreadful for continued rains, cold and tempests that ever any history

mentions. Not a day from May to October without rain. The fruits of the earth spoiled, and according to their different Religions some grumbled, some swore, and some few prayed.

Whitstable. (p. 203). Sept. 8th day, 1692. An Earth Quake pretty much witness the inhabitants of the whole parish.—Thos. Willard, Parish Clerk.

Great Chart. (p. 52). 1612, Dec. 28th. Christopher Reynolds of Wy, (Slaine in a fearful tempest happening in our church in the forenoon of the 27th day of this month, all the congregation being gathered together, and the Minister in his Sermon) buried.

Croydon. (p. 62). 1607, Dec. The greatest frost began the IX day of this month ended on Candlemass Eve's Eve.

John Keble's Parishes, by Charlotte Yonge. (Macmillan, 1898) (p. 37) contains the following extracts from the Hursley Parish Registers. The great divine spent the greater part of his life at Hursley, but these are the only entries relating to the weather:

1582. A great hail storm happened at Hursley, Baddesley, and in the neighbourhood this year. The hail stones measured nine inches in circumference.

1629. A great fall of snow in October. It was nearly half a foot deep, and remained on the ground three or four days.

Obituary

Mr. W. W. Bryant.—It is with extreme regret that we record the death of Mr. W. W. Bryant which occurred on January 31st after a brief illness. Mr. Bryant, who had graduated from Pembroke College, Cambridge, joined the staff of the Royal Observatory, Greenwich, in 1892, and from 1904 was in charge of the Meteorological and Magnetic Department. From that date the supervision of the meteorological observations made at the Observatory and their preparation for publication was his care. Though primarily an astronomer, Bryant entered on his meteorological work with great keenness and frequently astonished his meteorological friends by his intimate acquaintance with the Greenwich records. He seemed to carry the whole mass of figures in his head and could quote from memory the remarkable temperatures, heavy rainfall or other particulars appropriate to almost any meteorological discussion. He was a regular attendant at the meetings of the Royal Meteorological Society and at the Monday afternoon discussions held at the Meteorological Office. Almost always he took part in the debates, and his presence will be greatly missed. From 1916 to 1920 he was one of the Honorary Secretaries of the Royal Meteorological Society. In his younger days he was a keen hockey player and though compelled latterly to take a less active part in the game he continued to show his interest by refereeing in games in which the Observatory team took part. He acted in that capacity only a fortnight before his death.

The Weather of January, 1923

JANUARY was characterised by mild sunny weather in the south of the British Isles and by frequent gales in the north. The first few days, when depressions from the Atlantic were passing across the Islands, were unsettled with somewhat heavy rain at times but considerable bright intervals; but from the 11th onwards conditions in the south were anti-cyclonic. Gales occurred on the coasts on the 2nd and again on the 9th and 10th when a deep depression passed across northern Scotland to Scandinavia. In its rear came northerly winds associated in Scotland with showers of hail, sleet and snow. Although temperature on the whole was above normal, some cold days were experienced, for instance on the 17th, when a small centre of high pressure was over London, frost and fog prevailed in many parts, the maximum temperature at Kew Observatory being only 29° F. Sunshine was also well above normal in the south and south-east. The third week in particular was notable for sunny days, records of six or seven hours of bright sunshine occurring at many places, and on the 23rd, as much as eight hours was registered at Pendennis Castle, Falmouth. The total amount of sunshine recorded at Great Yarmouth (Gorleston) was double that recorded in January, 1922.

The general rainfall in the British Isles, expressed as a percentage of the average, was :—England and Wales, 82; Scotland, 123; Ireland, 90; British Isles, 98.

The month was remarkable for floods and heavy rain or snow falls in various countries. On the 1st, floods were reported in the Seine and in the lower valley of the Loire and Sèvre, Nantes being flooded. On the 3rd the Rhine reached an unusually high level, and on the 12th the Seine was again high. Snow fell very heavily in Central France from the 22nd to the 24th. In Switzerland the snowfall during the month was heavy, causing avalanches in which lives were lost.

Unusually heavy rainfall was experienced in Ceylon, and on the 14th the district round the ruined city of Anuradhapura was badly flooded. The floods were increased by the bursting of an old reservoir and led to serious railway accidents.

As the result of a " cloudburst " at Devil's Kantur a railway bridge has been washed away. At Pietersburg four and a half inches (about 114 mm.) of rain fell in two hours.

In Brazil the rainfall was below normal in the north and centre, the general deficit being 13 mm. and 50 mm. respectively. The scarcity was more felt in Ceara. In the south, rain was plentiful, averaging 44 mm. above normal. During the last fortnight there was a very hot spell over the south and centre. The atmospheric circulation was characterized by small and inactive " highs," with a preponderance of continental depressions. The condition of the coffee crop is excellent.

Rainfall Table for January, 1923

CO.	STATION.	In.	mm.	Per-cent. of Av.	CO.	STATION.	In.	mm.	Per-cent. of Av.
Lond.	Camden Square.....	1·28	32	69	*Leics*	Leicester Town Hall...	1·14	29	...
Sur .	Reigate, Hartswood...	1·59	40	...	„ .	Belvoir Castle.....	1·19	30	67
Kent.	Tenterden, View Tower	1·42	36	66	*Rut* .	Ridlington.....	1·25	32	...
„ .	Folkestone, Boro. San.	...	...	...	*Linc.*	Boston, Skirbeck	1·44	37	89
„ .	Broadstairs	1·30	33	75	„ .	Lincoln, Sessions House	1·71	43	102
„ .	Sevenoaks, Speldhurst.	1·65	42	...	„ .	Skegness, Estate Office.	1·25	32	72
Sus .	Patching Farm.....	1·77	45	68	„ .	Louth, Westgate	1·70	43	78
„ .	Eastbourne, Wilm. Sq.	1.41	36	54	„ .	Brigg	1·67	42	93
„ .	Tottingworth Park....	1·62	41	...	*Notts.*	Worksop, Hodsock....	·93	24	53
Hants	Totland Bay, Aston...	1·29	33	56	*Derby*	Mickleover, Clyde Ho..	1·44	37	72
„ .	Fordingbridge, Oaklnds	1·66	42	60	„ .	Buxton, Devon. Hos...	6·10	155	136
„ .	Portsmouth, Vic. Park.	1·52	39	64	*Ches.*	Runcorn, Weston Pt...	1·86	47	78
„ .	Ovington Rectory	2·10	53	78	„ .	Nantwich, Dorfold Hall	2·30	58	...
„ .	Grayshott	2·13	54	79	*S.L* .	Bolton, Queen's Park .	5·06	129	...
Berks	Wellington College...	1·70	43	86	*C.L* .	Stonyhurst College....	7·05	179	165
„ .	Newbury, Greenham..	1·77	45	77	„ .	Southport, Hesketh...	2·26	57	89
Herts.	Bennington House....	1·65	42	91	*N.L* .	Lancaster, Strathspey.	4·07	103	...
Bucks	High Wycombe	1·68	43	80	*WRY*	Sedbergh, Akay	7·34	186	134
Oxf. .	Oxford, Mag. College..	1·52	39	88	„ .	Wath-upon-Dearne ...	·84	21	44
Nor .	Pitsford, Sedgebrook..	1·11	28	60	„ .	Bradford, Lister Pk...	2·14	54	74
Beds.	Woburn, Crawley Mill.	1·28	33	75	„ .	Oughtershaw Hall	8·26	210	...
Cam.	Cambridge, Bot. Gdns.	1·35	34	90	„ .	Wetherby, Ribston H..	1·21	31	59
„ .	March	...	...	...	*ERY*	Hull, Pearson Park ...	1·32	33	66
Essex	Chelmsford, CountyLab	1·27	32	...	„ .	Holme-on-Spalding ...	1·52	39	...
„ .	Lexden, Hill House...	1·28	33	...	„ .	Lowthorpe, The Elms.	1·42	36	69
Suff .	Hawkedon Rectory ...	1·66	42	95	*NRY*	West Witton, Ivy Ho..	2·36	60	...
„ .	Haughley House.....	1·22	31	...	„ .	Pickering, Hungate ...	1·65	42	...
Norf.	Beccles, Geldeston....	1·26	32	76	„ .	Middlesbrough	1·18	30	74
„ .	Norwich, Eaton	1·85	47	94	„ .	Baldersdale, Hury Res.	...	...	...
„ .	Blakeney	1·96	50	114	*Durh.*	Ushaw College	1·07	27	52
„ .	Swaffham	1·77	45	96	*Nor* .	Newcastle, Town Moor.	1·25	32	61
Wilts.	Calne, High Street	...	...	...	„ .	Bellingham Manor....	2·19	56	...
Dor .	Evershot, Melbury Ho.	2·41	61	69	„ .	Lilburn Tower Gdns...	1·97	50	104
„ .	Weymouth, Westham..	1·44	37	59	*Cumb*	Penrith, Newton Rigg..	2·49	63	48
S.D .	Shaftesbury, Abbey Ho.	1·38	35	53	„ .	Carlisle, Scaleby Hall .	...	...	...
„ .	Plymouth, The Hoe...	2·21	56	67	„ .	Seathwaite	13·50	343	102
„ .	Polapit Tamar	3·34	85	90	*Glam.*	Cardiff, Ely P. Stn....	2·82	72	75
„ .	Ashburton, Druid Ho..	2·81	72	55	„ .	Treherbert, Tynywaun	7·73	196	...
„ .	Cullompton	2·51	64	77	*Carm*	Carmarthen Friary....	3·54	90	81
„ .	Sidmouth, Sidmount ..	1·92	49	67	„ .	Llanwrda, Dolaucothy.	4·68	119	88
N.D..	Filleigh, Castle Hill ...	4·31	109	...	*Pemb*	Haverfordwest, Portf'd	2·61	66	57
„ .	Hartland Abbey.....	2·02	51	...	*Card.*	Gogerddan.....	5·53	141	135
Corn.	Redruth, Trewirgie ...	3·24	82	77	„ .	Cardigan, County Sch..	3·10	79	...
„ .	Penzance, Morrab Gdn.	2·75	70	73	*Brec.*	Glasbury, Gwernyfed..	...	...	...
„ .	St. Austell, Trevarna..	3·74	95	87	*Rad* .	Birm.W.W.Tyrmynydd	6·38	162	101
Som	Street, Hind Hayes ...	1·48	38	...	*Mont.*	Lake Vyrnwy	4·80	122	...
Glos..	Clifton College	2·02	51	71	*Denb.*	Llangynhafal	2·30	58	...
„ .	Cirencester	2·38	61	92	*Mer* .	Dolgelly, Bryntirion..	9·57	243	168
Here.	Ross, County Obsy. ...	1·03	26	43	*Carn.*	Llandudno	1·98	50	77
„ .	Ledbury, Underdown.	1·11	28	52	„ .	Snowdon, L. Llydawll.	14·29	363	...
Salop	Church Stretton.....	1·80	46	71	*Ang* .	Holyhead, Salt Island.	...	...	...
„ .	Shifnal, Hatton Grange	1·86	47	96	„ .	Lligwy	3·18	81	...
Staff.	Tean, The Heath Ho...	2·61	66	102	*Man.*	Douglas, Boro' Cem...	...	...	...
Worc.	Ombersley, Holt Lock.	1·24	31	65	*Guer.*	St. Peter Port, Grange.	2·30	59	79
„ .	Blockley, Upton Wold.	2·19	56	93	*Wigt.*	Stoneykirk, Ardwell Ho	2·91	74	99
War	Farnborough.....	1·67	42	78	„ .	Pt. William, Monreith .	3·57	91	...
„ .	Birmingham, Edgbaston	1·81	46	90	*Kirk.*	Carsphairn, Shiel.	8·18	208	...

Rainfall Table for January, 1923——*continued*

CO.	STATION.	In.	mm.	Per-cent. of Av.	CO.	STATION.	In.	mm	Per-cent. of Av.
Kirk.	Dumfries, Cargen.....	2·92	74	73	*Caith*	Loch More, Achfary...	14·68	373	202
Dum	Drumlanrig	3·33	85	81	,, ..	Wick	3·97	101	161
Roxb	Branxholme	2·12	54	77	*Ork .*	Pomona, Deerness	5·31	135	154
Selk .	Ettrick Manse.....	5·90	150	...	*Shet .*	Lerwick	5·38	137	126
Berk.	Marchmont House	1·67	42	74	*Cork.*	Caheragh Rectory	4·38	111	...
Hadd	North Berwick Res....	·94	24	55	,, ..	Dunmanway Rectory.	3·65	93	58
Midl	Edinburgh, Roy. Obs..	1·55	39	88	,, ..	Ballinacurra	1·53	39	38
Lan .	Biggar	3·07	78	115	,, ..	Glanmire, Lota Lo. ...	2·13	54	49
Ayr .	Kilmarnock, Agric. C..	4·21	107	123	*Kerry*	Valencia Obsy.	2·56	65	47
,, .	Girvan, Pinmore.....	5·14	131	109	,, .	Gearahameen	7·30	185	...
Renf.	Glasgow, Queen's Pk..	3·79	96	113	,, .	Killarney Asylum.....	3·55	90	60
,, .	Greenock, Prospect H..	8·28	210	121	,, .	Darrynane Abbey	2·71	69	54
Bute .	Rothesay, Ardencr'g..	6·86	174	152	*Wat .*	Waterford, Brook Lo..	1·73	44	47
,, .	Dougarie Lodge	4·72	120	...	*Tip .*	Nenagh, Cas. Lough...	3·62	92	91
Arg .	Glen Etive.....	...	...	...	,, .	Tipperary	3·09	79	...
,, .	Oban	7·72	196	...	,, .	Cashel, Ballinamona ..	2·81	71	74
,, .	Poltalloch	8·82	224	176	*Lim .*	Foynes, Coolnanes	3·71	94	98
,, .	Inveraray Castle.....	12·26	311	149	,, .	Castleconnell Rec.	4·64	118	...
,, .	Islay, Eallabus.....	6·38	162	136	*Clare*	Inagh, Mount Callan ..	7·17	182	...
,, .	Mull, Benmore	15·20	386	...	,, .	Broadford, Hurdlest'n.	4·04	103	...
,, .	Mull, Quinish	8·03	204	143	*Wex*	Gorey, Courtown Ho...	1·36	35	44
,, .	Loch Leven Sluice	2·40	61	76	*Kil .*	Kilkenny Castle	1·85	47	58
Perth	Loch Dhu	11·00	279	121	*Wic .*	Rathnew, Clonmannon	1·29	33	...
,, ..	Balquhidder, Stronvar.	8·38	213	99	*Car .*	Hacketstown Rectory .	2·36	60	66
,, ..	Crieff, Strathearn Hyd.	3·81	97	95	*QCo..*	Blandsfort House.....	2·60	66	79
,, ..	Blair Atholl.....	3·88	99	118	,,	Mountmellick	3·02	77	...
,, .	Coupar Angus School..	2·03	52	86	*KCo.*	Birr Castle.....	2·93	74	104
Forf.	Dundee, E. Necropolis.	1·57	40	81	*Dub .*	Dublin, FitzWm. Sq...	1·71	43	75
,, .	Pearsie House.....	3·16	80	...	,, .	Balbriggan, Ardgillan .	1·90	48	83
,, .	Montrose, Sunnyside..	1·74	44	87	*WM*	Athlone, Twyford.....	...	...	...
Aber.	Braemar Bank	4·45	113	145	,, .	Mullingar, Belvedere .	3·42	87	107
,, .	Logie Coldstone Sch. ..	3·18	81	144	*Long*	Castle Forbes Gdns....	3·52	89	106
,, .	Aberdeen, Cranford Ho	2·89	73	121	*Gal .*	Galway, Waterdale ...	3·68	93	...
,, .	Fyvie Castle	3·19	81	...	,, .	Ballynahinch Castle ..	...	...	...
Mor .	Gordon Castle.....	2·85	72	141	,, .	Woodlawn	...	...	...
,,	Grantown-on-Spey....	3·55	90	147	*Mayo*	Crossmolina, Enniscoe	...	...	...
Na .	Nairn, Delnies.....	2·47	63	124	,, .	Blacksod Point.....	...	...	...
Inv..	Ben Alder Lodge	10·35	263	...	,, .	Westport House.....	6·80	173	...
,, .	Kingussie, The Birches	5·14	331	...	,, .	Delphi Lodge	12·48	317	...
,, .	Fort Augustus	8·23	209	152	*Sligo*	Markree Obsy.	5·15	131	132
,, .	Loch Quoich, Loan....	27·00	686	...	*Ferm*	Enniskillen, Portora ..	4·04	103	...
,, .	Glenquoich	24·21	615	176	*Arm.*	Armagh Obsy.	2·56	65	102
,, .	Inverness, High Sch. ..	4·48	114	181	*Down*	Warrenpoint	2·25	57	...
,, .	Arisaig, Faire-na Squir	7·81	198	...	,, .	Seaforde	3·49	89	111
,, .	Fort William.....	12·64	321	132	,, .	Donaghadee	2·19	56	87
,, .	Skye, Dungevan.....	9·37	238	...	,, .	Banbridge, Milltown .	1·95	49	87
,, .	Barra, Castlebay	...	...	...	*Ant .*	Belfast, Queen's Univ..	...	...	...
R&C	Alness, Ardross Cas. ..	5·92	150	155	,, .	Glenarm Castle.....	4·73	120	...
,, .	Ullapool.....	8·46	215	...	,, .	Ballymena, Harryville	4·47	113	120
,, .	Torridon, Bendamph..	14·16	360	151	*Lon .*	Londonderry, Creggan	5·15	131	143
,, .	L. Carron, Plockton...	9·22	234	...	*Tyr .*	Donaghmore	3·97	101	...
,, .	Stornoway	6·60	168	128	,, .	Omagh, Edenfel	5·47	139	155
Suth.	Dunrobin Castle.....	...	...	...	*Don .*	Malin Head	3·91	99	150
,, .	Lairg	7·33	186	...	,, .	Letterkenny Hos	5·22	133	125
,, .	Forsinard	...	...	...	,, .	Dunfanaghy	4·14	105	102
,, .	Tongue Manse.....	4·44	113	113	,, .	Narin, Kiltoorish	4·76	121	...
,, .	Melvich School.....	4·38	111	133	,, .	Killybegs, Rockmount.	10·35	263	185

Climatological Table for the British Empire, August, 1922

STATIONS	PRESSURE		TEMPERATURE							Relative Humidity	Mean Cloud Am'nt	PRECIPITATION			BRIGHT SUNSHINE	
			Absolute		Mean Values				Mean							
	Mean of Day M.S.L.	Diff. from Normal	Max.	Min.	Max.	Min.	½ max. and min.	Diff. from Normal	Wet Bulb.			Am'nt	Diff. from Normal	Days	Hours per day	Percentage of possible.
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	0—10	mm.	mm.			
London, Kew Obsy.	1014·4	− 0·6	73	43	66·0	51·0	58·5	− 3·1	55·6	74	7·4	53	− 4	16	4·2	29
Gibraltar	1015·1	− 0·1	95	61	82·4	68·6	75·5	− 0·6	68·0	71	3·5	0	− 4	0	...	...
Malta	1015·1	+ 0·7	93	71	85·7	75·0	80·3	+ 2·0	72·5	66	1·0	0	− 3	0	10·8	80
Sierra Leone	1013·6	+ 0·3	86	70	81·5	72·3	76·9	− 1·3	72·9	81	8·7	833	− 69	27	...	...
Lagos, Nigeria	1012·7	− 0·9	87	67	82·0	72·7	77·3	+ 0·2	73·6	78	8·4	146	+ 78	10	...	...
Kaduna, Nigeria	1012·8	− 1·0	90	...	79·0	...	...	...	66·7	75	...	256	− 40	15	...	...
Zomba, Nyasaland	1013·7	− 2·5	88	53	81·6	58·9	70·3	+ 5·6	...	71	2·9	3	− 5	1	...	...
Salisbury, Rhodesia	1013·6	− 5·5	86	43	79·5	50·5	65·0	+ 5·1	52·6	45	0·8	0	− 2	0	...	...
Cape Town	1018·2	− 2·0	69	39	60·2	46·5	53·3	− 1·9	51·0	81	6·1	94	+ 7	14	...	...
Johannesburg	1018·2	− 2·5	75	28	65·0	44·7	54·9	+ 1·0	43·3	58	1·7	34	+ 25	3	9·3	84
Mauritius	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bloemfontein	...	...	80	23	68·2	38·2	53·2	+ 1·0	41·2	60	2·8	4	− 8	3	...	...
Calcutta, Alipore Obsy.	999·3	− 1·7	92	76	88·1	78·9	83·5	+ 0·5	80·5	79	8·8	460	+151	*20	...	...
Bombay	1005·2	− 0·5	85	75	83·7	77·0	80·3	− 0·4	76·1	81	8·6	131	−229	*29	...	...
Madras	1004·3	− 1·2	101	73	96·2	78·0	87·1	+ 1·4	76·6	64	7·1	97	− 28	*21	...	...
Colombo, Ceylon	1009·3	+ 0·4	87	74	85·5	77·0	81·3	− 0·2	77·0	73	8·8	28	− 57	10	...	...
Hong Kong	1002·2	− 3·0	93	75	87·3	78·8	83·1	+ 1·0	78·3	82	7·8	445	+ 80	25	5·8	45
Sandakan	...	...	90	73	88·1	74·6	81·3	− 0·6	...	...	...	252	+ 47	14	...	...
Sydney	1016·1	− 2·1	74	42	63·9	46·8	55·3	+ 0·3	50·0	61	3·5	46	− 32	9	7·2	66
Melbourne	1016·6	− 1·5	64	33	56·7	42·1	49·4	− 1·7	46·9	75	6·3	63	+ 17	19	...	...
Adelaide	1018·5	− 0·7	69	37	60·8	45·8	53·3	− 0·6	48·7	70	5·3	65	+ 1	16	5·3	49
Perth, W. Australia	1019·3	+ 0·5	76	37	64·6	49·2	56·9	+ 0·9	54·2	74	5·6	132	− 11	22	5·6	51
Coolgardie	1019·7	+ 0·4	80	35	65·4	43·0	54·2	+ 0·6	50·3	53	4·7	61	+ 35	7	...	...
Brisbane	1017·3	− 1·7	79	39	70·9	47·9	59·4	− 1·2	54·0	57	2·2	4	− 52	4	...	...
Hobart, Tasmania	1012·1	− 1·5	62	35	55·4	41·2	48·3	+ 0·3	44·2	72	6·5	52	+ 5	14	5·0	48
Wellington, N.Z.	1015·0	+ 0·3	61	31	56·8	43·5	50·1	+ 1·6	46·4	75	5·9	58	− 58	12	5·3	51
Suva, Fiji	1013·1	− 1·2	86	66	80·9	69·5	75·2	+ 1·5	72·6	87	7·8	268	+ 59	19	...	...
Kingston, Jamaica	1013·3	− 0·4	92	70	89·2	73·2	81·2	− 0·3	...	77	5·5	55	− 38	12	...	...
Grenada, W.I.	1012·8	+ 0·2	88	71	84·7	75·0	79·9	+ 0·4	75·3	75	4·3	225	− 14	22	...	...
Toronto	1015 3	− 0·1	93	48	80·1	57·9	69·0	+ 2·4	61·5	74	3·4	37	− 33	8	...	...
Winnipeg	1013·0	− 0·9	90	44	79·7	55·2	67·5	+ 4·5	62·8	83	3·9	34	− 26	7	...	...
St. John, N.B.	1014·9	− 0·5	78	47	66·9	54·1	60·5	− 0·1	57·6	88	6·8	265	+167	14	...	...
Victoria, B.C.	1015·9	− 1·3	82	48	66·5	52·1	59·3	− 0·8	54·8	85	4·6	18	+ 1	10	...	...

* For Indian stations a rain day is a day on which 0·1 in. (2·5 mm.) or more rain has fallen.

Victoria, B.C.	1895	15	32	45	55·9	32·1	44·0	58	31·5	89	18	15	1	15	11	11

* For Indian stations a rain day is a day on which 0·1 in. (2·5 mm.) or more rain has fallen.